



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/722,558	11/28/2003	Stefanie R. Chiras	YOR920030367US1 (20140/03)	4980
30678	7590	08/24/2005	EXAMINER	
CONNOLLY BOVE LODGE & HUTZ LLP SUITE 800 1990 M STREET NW WASHINGTON, DC 20036-3425			BOOTH, RICHARD A	
			ART UNIT	PAPER NUMBER
			2812	

DATE MAILED: 08/24/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/722,558

Applicant(s)

CHIRAS ET AL.

Examiner

Richard A. Booth

Art Unit

2812

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 June 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) 23-30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 0205.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicant's election of group I in the reply filed on 6/6/05 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States

Claims 1 and 3-14 are rejected under 35 U.S.C. 102(b) as being anticipated by Lu et al., EP 1 233 448.

Lu et al. shows the invention as claimed including a process for forming an electrically conductive metallic interconnect in a via in a dielectric which comprises: providing a dielectric layer (102,104) in a substrate wherein the substrate comprises electrically conductive copper lines 101, forming a trench or via 106,108 in the dielectric layer and exposing electrically conductive line in the substrate; depositing a first liner layer 124 comprising, for example, tantalum on the walls and bottom of the trench or via; removing residual contamination from the bottom of the trench or via using argon etching (see fig. 3C); depositing a second liner layer 126 of tantalum on the walls and

the bottom of the trench or via; depositing a copper seed layer (see paragraph 0021) in the trench or via and filling the trench or via with electrically conductive material 118 such as copper (see figs. 3A-3F and paragraphs 0010-0022).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 15-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lu et al., EP 1 233 448 in view of Lopatin et al., U.S. Patent 6,893,955.

Lu et al. is applied as above but does not expressly disclose depositing an adhesion layer prior to depositing the first liner layer, and wherein residual contamination is removed from the bottom of the trench prior to depositing the first liner layer.

Lopatin et al. discloses forming an adhesion layer over exposed inner surfaces of a via (see col. 1-lines 55-61). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device of Lu et al. so as to form an adhesion layer on the inner surfaces of the via because this will allow for good adhesion of subsequently deposited layers. With respect to residual contamination being removed from the bottom of the trench prior to depositing the first liner layer, the selection of any order of performing process steps is prima facie

Art Unit: 2812

obvious in the absence of new or unexpected results (see *In re Burhans*, 154 F.2d 690, 69 USPQ 330 (CCPA 1946)).

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lu et al., EP 1 233 448 in view of Lee et al., U.S. Patent 6,486,059.

Lu et al. is applied as above but does not expressly disclose a low-K dielectric material having a dielectric constant of less than 3.9.

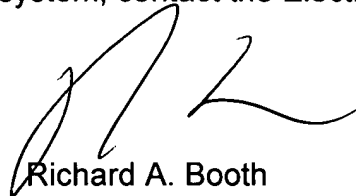
Lee et al. discloses forming an interlayer dielectric of a material such as SiLK which has a dielectric constant in the claimed range (see col. 2-lines 20-36). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the process of Lu et al. so as to form an interlayer dielectric of the claimed material because such an interlayer dielectric is a suitable material to be used in metallization processes.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Richard A. Booth whose telephone number is (571) 272-1668. The examiner can normally be reached on Monday-Thursday from 7:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt can be reached on (571) 272-1873. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Richard A. Booth
Primary Examiner
Art Unit 2812

August 22, 2005